



SKILLQUEST EDU: GAME-BASED EDUCATION FOR STUDENTS WITH DISABILITIES (DEAF)

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ABSTRACT

SkillQuest Edu is an innovative platform empowering deaf individuals in mastering pronunciation and language skills with over 90% accuracy. In the current educational landscape, traditional approaches may not fully accommodate diverse learning needs, leading to limited resources and disparities. Our proposed system addresses these challenges by integrating game-based education, providing interactive learning experiences tailored to individual strengths and challenges. SkillQuest Edu aims to bridge communication barriers, fostering confidence and proficiency in language acquisition among deaf learners.

KEYWORDS: Speech Recognition, Audio Preprocessing, Feature Extraction Artificial Intelligence (AI), Text Transcription, Model Training, Model Evaluation

1. INTRODUCTION

In response to the isolated and conflicting educational needs of deaf students, our program offers a comprehensive process that uses educational games to adjust learning outcomes and support the learning environment. Educational facilities for deaf students often lack resources and strategies designed to support their learning differences. Cultural practices may not adequately address the unique communication, language, and needs of deaf people, leading to educational and social inequalities. Recognizing these challenges, our programs aim to bridge the gap by providing versatile solutions that combine new technologies with proven data.

We aim to solve these problems by combining innovative, evidence-based practices and partnerships with our work. By harnessing the power of game-based learning, we aim to provide deaf students with interactive and engaging learning that meets their individual strengths, interests and challenges. By building partnerships with teachers, parents, researchers and policy makers, we aim to create a supportive environment that encourages deaf students to reach their full potential.

As a cooperative and cooperative, we want to create an educational environment where deaf students can achieve academic success, encourage social thinking, and thrive in a learning environment. Our services work to provide more inclusive and equitable educational opportunities for deaf students worldwide, considering the integration of technology, accessibility, social support systems, and ethical considerations. We believe that our programs that focus on innovation, integration, and collaboration have the potential to make a significant impact on educational and health outcomes among deaf students, ultimately leading to greater integration.

2. LITERATURE SURVEY

The literature survey for this paper aims to provide a comprehensive overview of existing research related to speech recognition systems, with a focus on methodologies, technologies, and applications. Through an in-depth analysis of recent studies and systematic literature reviews, this survey explores the evolution of speech recognition techniques, the challenges encountered, and the advancements made in the field. Key topics covered include audio preprocessing, feature extraction, neural network models, machine learning algorithms, and real-world applications of speech recognition technology. By synthesizing insights from diverse sources, this literature survey sets the stage for understanding the current state-of-the-art and identifying opportunities for further research and innovation in speech recognition systems.

A qualitative literature review conducted by Nurzamila Zasira Zolkipli et al. (2023) examined the effectiveness of game-based learning educational software for preschoolers with learning disabilities (LD). In response to the rapid development of multimedia pedagogy in education, GBL has emerged as an effective method to enhance children's learning by encouraging collaboration and cooperation. This review followed PRISMA article selection criteria, with 109 articles retrieved from databases such as Scopus and Science Direct, and 14 articles were finally reviewed as a collection. Save before including and excluding. Findings show that GBL has a positive effect on cognitive development and academic achievement, especially in children with learning disabilities. Additionally, this review highlights the importance of developing appropriate and effective GBL courses suitable for preschool children with learning disabilities, providing insight to educators and curriculum designers. [1]

A qualitative literature review conducted by Ahmed Tlili, Mouna et al. (2022) explored the field of game-based learning

for students with disabilities, identified key points, and suggested future research and practice. This study highlights deficiencies in the design, implementation, and evaluation of outcomes of educational interventions in special education. This review adopted reflective activity (AT) and reviewed 96 studies focusing on student-based learning and content, roles of participation, and performance evaluation. Key findings include a lack of parental involvement at times, problems measuring performance due to unequal student populations, and educational inequality. The study concludes by recommending the development of general and specific guidelines to help practitioners use educational games for students with disabilities. [2]

A qualitative literature review conducted by Stansing et al. (2020) explored the use of digital game-based learning (GBL) as a tool to support the learning and development of students with intellectual disabilities. In this review, which included 21 studies from different sources, it was revealed that the most used game type is video games, the most popular ones are computers and tablets, and the use of technology is important. Additionally, the findings show that people often focus on improving skills rather than developing transferable skills. Overall, this review highlights the potential of digital GBL to improve learning outcomes for gifted students. [3]

In their research article, Jose A. Gallud et al. (2021) explores the field of technology and play-based learning for children with special needs. This study focuses on the various disabilities that include the term “special needs” and addresses the learning disabilities that affect children and provides a comprehensive review of research in this area. By carefully reviewing previous research, the authors aim to present the most advanced methods, tools, and games used in educational technology for children with special needs. Despite previous reviews, this study highlights the ongoing challenge in determining the most effective tools and techniques for this population. The authors reveal their understanding of disability, technological impact, subject matter, and game use through analysis of 18 articles carefully selected from 614 contributions. Additionally, this study identifies important research opportunities to increase the effectiveness and inclusivity of technology-enhanced learning solutions specifically for children in need. [4]

The impact of play on the development of special education has received increasing attention due to technological advances in special education. Although good evaluations in this area are still limited, gamification strategies are being used to improve the skills of individuals with special needs. In a recent study by Elham Hussein et al. (2023) conducted a literature review to investigate the impact of play on skill development in special needs. This review aims to identify areas, groups and topics in sports for people with special needs, while also highlighting sensitivity to the technology used to improve their skills. This study used PRISMA criteria for literature review and meta-analysis and found that game design supports the development of a variety of skills, especially educational development, for individuals with special needs. However, more research is needed to address gaps in the game and explore unexplored

areas. [5]

III. PROPOSED SOLUTION

The current study differed in that traditional practices to meet the needs of hearing-impaired children often rely on traditional teaching methods that may not meet their needs. Although some schools and colleges offer specialized services such as sign interpreters or hearing aids, the availability and effectiveness of these resources may be limited. Additionally, there may be a lack of data collection and analysis regarding deaf students' academic experiences, challenges, and interests, which may impact the development of the intervention and support plan. Additionally, current learning technologies may not be able to leverage the full potential of playful learning and artificial intelligence (AI) to provide personalized learning experiences and immediate support to hearing-impaired students. In general, the current system can be characterized by isolation, limited resources, and inequalities in the educational and social relationships of deaf students.

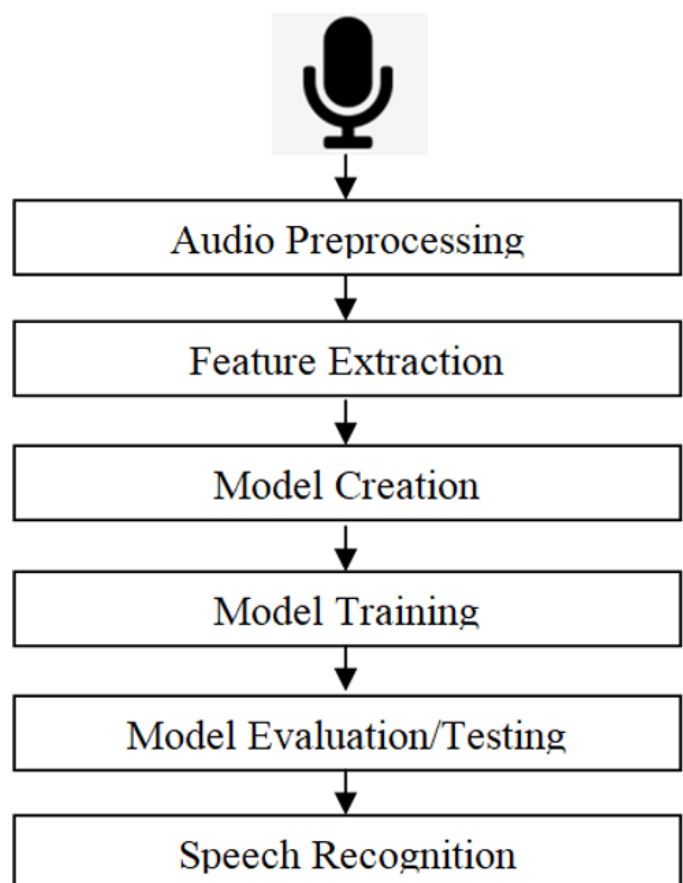


Fig.1 System Architecture

Audio Preprocessing

Audio pre-processing modules play an important role in optimizing raw data to improve the quality of the signal and remove important features needed to understand the truth. The module uses a variety of techniques, including noise reduction to eliminate background noise, filtering to improve speech clarity, and normalization to standardize audio levels in different recordings. Using the pre-processing method, the module prepares the audio files for further analysis to ensure

good performance in the next process.

Feature Extraction

Feature extraction is a simple module responsible for converting preprocessed audio data into a format suitable for speech recognition model analysis. This process involves extracting important features from the audio signal, capturing important speech features such as Mel Frequency Cepstrum Coefficients (MFCCs), spectral features and motor dynamics. These extracted features provide access to speech recognition models, providing valuable information about basic speech patterns that need to be accurately annotated.

Model Creation

Modeling involves the development and architecture of neural network models designed for speech recognition. This involves selecting an appropriate neural network architecture such as a convolutional neural network (RNN) or convolutional neural network (CNN), creating input and output processes to handle noise and generate the script, and tuning hyperparameters to improve the performance of the model. The aim of this model is to create a powerful and effective speech recognition model that can record words different from the input language.

Model Training

Training model is an important stage in which the neural network model learns to recognize speech patterns by adjusting its parameters according to the recorded data and the corresponding data collection. By optimizing using techniques such as gradient descent and backpropagation, the model adjusts its internal representation to minimize prediction errors and improve the accuracy of typing. The training process aims to correct the poor quality of the model to better adapt to invisible information and achieve high-level speech recognition tasks.

Model Evaluation/Testing

The test/test model evaluates the performance of the speech recognition model learned using the test-specific dataset. Various metrics, including accuracy, precision, recall, and F1 score, were calculated to evaluate the model's performance on the transcription task. In addition, real situations and cases are simulated to ensure the robustness and reliability of the model in practical use. This rigorous testing process will help improve the quality of speech recognition standards and identify areas for improvement.

Speech Recognition

The speech recognition system represents the final stage of the system where the training model is sent to the real-time voice input process and converted into output. In this model, the training model is applied to the audio stream by segmenting and analyzing speech patterns to generate the relevant text. Accepted notes are then processed or added to the notes, enabling interaction with the system and facilitating the communication of messages.

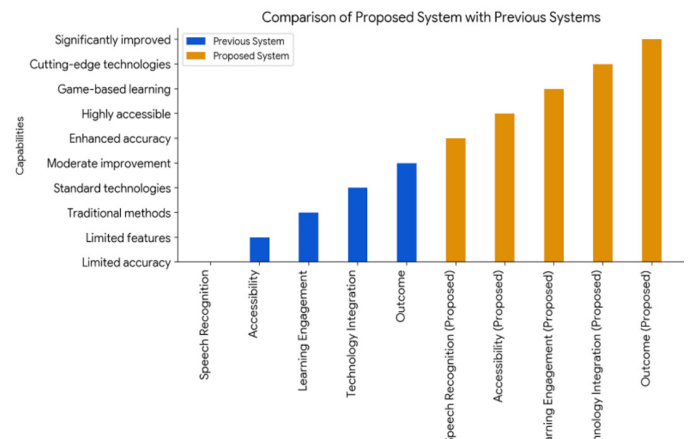


Fig.2 Comparison of proposed solution with previous solution

4. SYSTEM IMPLEMENTATION

In addition to front-end and back-end development, our implementation will include testing and debugging procedures to ensure reliability and functionality. We use automated testing systems such as Jasmine and Karma to conduct rigorous testing on individual products to detect and fix bugs or defects early in the development cycle. Use continuous integration and deployment practices to simplify testing and deployment processes and enable rapid recovery and system development.

Also, the integration of language recognition is an important feature of our application and requires careful evaluation and selection of APIs or libraries. This is also necessary. We evaluate various options, such as Web Speech API and Google Cloud Speech-to-Text API, to determine the most appropriate solution based on accuracy, latency, and cost-effectiveness. By seamlessly integrating speech recognition capabilities into our systems, we aim to improve user experience and accessibility, allowing users to easily interact with applications.

In addition, the scalability and distribution of our system is solved by utilizing modern technologies with distribution tools and cloud infrastructure. Technologies such as Docker and AWS streamline the deployment process, allowing resources to be aligned efficiently with customer needs. By leveraging a cloud-based hosting platform, we ensure system availability and performance and allow users to seamlessly access advanced audio features across multiple devices and platforms.

5. RESULT AND DISCUSSION

A literature review of game-based learning (GBL) approaches for students with disabilities provides insight into effectiveness, contrasts, and areas for improvement in this field. Results show growing interest in using GBL to improve learning outcomes for people with disabilities across a wide range of studies. Research on multifaceted teaching in preschool education shows a significant impact on the cognitive development and learning of children with learning disabilities (LD), highlighting the importance of collaboration and collaboration (Zolkipli et al., 2023).

Additionally, the analysis from an effectiveness perspective demonstrates the difficulty in designing and implementing GBL interventions for students with disabilities. It highlights the need for a comprehensive analysis that includes student-based situations, situational factors, and stakeholder engagement to improve learning outcomes (Tlili et al., 2022). Similarly, evaluations of digital GBL for students with intellectual disabilities show the emergence of large games and the use of technological devices such as PCs and tablets to support cognitive development (Stancin et al., 2020).

In addition, the differences between a technology-based educational program and game-based learning for children with special needs have been identified and it has been pointed out that more research is needed to determine the best tools and methods in this field (Gallud et al. ... People, 2021). Finally, examining games in special education shows the change in the development of skills of individuals with special needs, while also identifying areas for research and further research (Hussein et al., 2023).

Overall, the findings demonstrate the positive role of the GBL approach in improving the skills, academic achievement and intelligence of people with learning disabilities. However, they also emphasized the need for continued research and discovery to address existing gaps, improve methods and use new technologies to provide good and useful education to people with special needs.

6. CONCLUSION

Additionally, our plan highlights the importance of user-friendly design to ensure the platform is intuitive, accessible and meets the diverse needs of deaf people. We strive to create a revolutionary learning experience that adapts to the changing needs of society by prioritizing user feedback and iterative development. Through constant collaboration with teachers, parents, and stakeholders, we strive to foster an ecosystem that supports the growth of deaf students so they can succeed in life, studies, and other endeavors. In summary, game-based learning platforms for students with disabilities represent the light of learning and participation in learning. It breaks down educational barriers to provide an accessible and accessible platform that meets the unique needs of different students. The platform creates a supportive and learning environment, enabling students to succeed academically and socially, regardless of their abilities.

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